

HABONIM 

INDUSTRIAL VALVES LTD.



THE **White** BOOK

APRIL 2002





HABONIM HIGH PURITY BALL VALVES FLUID DELIVERY SYSTEM (FDS)

Scope

This document covers the specifications for Habonim ball valves and FDS designed, manufactured and supplied for the semiconductor industry.

Work Included

The information in this document is in accordance to international specifications and work procedures operated at Habonim and includes:

- ▶ Materials Ordering Specification
- ▶ Dimensional Specification
- ▶ Acceptable Vendors
- ▶ Purge Ports
- ▶ Surface Finish
- ▶ Cleaning
- ▶ Testing
- ▶ Packaging, Shipping, Marking
- ▶ Quality Assurance Specifications
- ▶ Standard Reference
- ▶ Test Results
- ▶ Valve Features
- ▶ Identification Code
- ▶ Pattern
- ▶ End Connection



Material Ordering Specification

- 1) Materials from which the end connectors are manufactured:
ASTM A-351 CF3M SS 316L
- 2) Materials meet the chemical composition and the mechanical properties specifications of:
Cast:
End connectors: **ASTM A-351 CF3M (SS 316L)**
ANSI/ASME B31.3
Welded:
End connectors and extensions: **ASTM A-269, A-450, A-632**
ANSI/ASME B31.3
NEPA 99
CGA G4.1 (1985).
- 3) Sulphur content of the end connectors for welding is ranged between 0.005% to 0.017%.
- 4) Tube extensions sized 1/2" and smaller are seamless; 1/2" and larger may be seamless or welded.
- 5) Interior surface finish (including: ball, end connectors and tube extensions) shall have a 25 Ra average finish.
- 6) Per request, end connectors for welding are made from material with the same heat lot number as that supplied for the project.

Valve Material Specification

Body	ASTM A351 CF8M
End Connectors	ASTM A351 CF3M (Sulphur content 0.005-0.017%)
Ball and Stem	ASTM A276 SS 316
Valve Seat	PTFE or Glass Filled PTFE
Body Seal	PTFE or Glass Filled PTFE
Stem Seal	Glass Filled PTFE

Dimensional Specification

- 1) All dimensional specifications for tubes and tube end connectors are specified according to ASTM A-269.
- 2) All end connectors dimensions are in inches or fractional part thereof.



- 3) All end connectors for welding are faced suitable for field automated orbital tube butt-welding.
- 4) Linear dimensions are manufactured to within $\pm 1/16$ " of "HABONIM" catalogue data.
- 5) The wall thickness is within $\pm 15\%$ for end connectors with outside diameter up to $1/2$ " and $\pm 10\%$ for end connectors with outside diameter of $1/2$ " and larger.
- 6) End connectors are manufactured with an extension sufficient in length to accommodate the particular welding equipment to be used during installation without damage to non-metallic components.
- 7) All valve sizes have minimum length of $1 1/2$ ", except sizes $1/4$ " and $3/8$ " which are 1 " length.

Acceptable Vendors

All tube extensions for welding and all end connectors for mechanical fittings are provided from the customer's acceptable vendors, per his request.

Purge Ports

Purge ports type and size are provided as per following:

Valve size $1 1/2$ " and less: $1/4$ " VCR Male or Compression fitting
Valve size 2 " and greater: $1/2$ " VCR Male or Compression fitting

Surface Finish

Surface Roughness of all wetted parts are:

Standard	Grit 180 (Ra 25-30)
Special	Grit 240, Grit 320 (20Ra, 15Ra) or better on special request.

Cleaning

All valves are cleaned in accordance with the following applicable documents:

NEPA 99
CGA G4.1 (1985)

The fabrication is such that it is suitable for installation without additional cleaning in the field.

All CNC processed valve-parts are cleaned to assure that they are free of emulsion composition and residues, involved in the machining process.



The following cleaning procedure is performed to each valve wetted part.

1. Ultrasonic bath
2. Degreasing
3. Primary DI rinse
4. Secondary DI rinse with flush
5. Blow dry with N₂ 99.999% pure, 0.01 micron filtered
6. Vacuum oven bake off
7. Immediate use or sealed in plastic

DI flowing rinse:

Water Resistivity (monitored continuously):
greater or equal to 18 megohm-cm, at 25°C.

The following is monitored every 6 months:

Particles: less than 10 particles per millilitre bigger than or equal to 0.2 microns.

Live Bacteria: 2 colonies per 100ml maximum.

Silica: less than 5 ppb.

Total Organic Carbon (TOC): less than or equal to 30 ppb.

Flow rate is sufficient to remove all residual solvent traces.

Nitrogen purge:

Drying and packaging with 99.999% pure nitrogen filtered with 0.01 micron rated filters, for a predetermined length of time, which results in moisture of 2 ppm or less.

Nitrogen purity levels are indicated below:

Impurity	Quality
Oxygen	<1.5 ppm
Moisture	<1 ppm
Total hydrocarbon	<1 ppm

Final rinsing, drying and packaging of valves takes place under Class 10,000 conditions. All the assembly of valves take place under class 1,000 conditions.

"HABONIM" employs independent laboratory testing to verify that the cleanroom is of Class 10,000.

Tests are made on a regular basis.

Testing

All valves are 100% helium leak tested. Valves are assembled and tested without any lubricants. Helium leak tests are performed using a helium leak detector machine with a sensitivity of 1×10^{-10} atm cc He/sec and a vacuum pump. The standard leak rate tests are listed below. Lower leak rates are optional on request and should be stated for in advance.

**Helium (He) leak testing:**

Inboard leak rate	= 1×10^{-7} atm cc/sec	(standard procedure)
Across-seat leak rate	= 1×10^{-7} atm cc/sec	(standard procedure)
Outboard leak rate	= 1×10^{-7} atm cc/sec	(on special request)

Moisture Testing:

Valves can be tested for moisture impurity on request. The standard moisture level is:

Moisture test **200 ppb** (lower levels are optional on special request)

Inspection:

All valve components are visually inspected under a bright white light for any defects or impurities.

All assembled valves are inspected prior to packaging to verify they are functional, tagged and ready for dispatch.

Packaging

- 1) Packaging is done in the same cleanroom where the cleaning process was completed.
- 2) Components are not removed from the cleanroom until they are properly packaged and sealed.
- 3) Each finished (dry, completed, inspected and approved) end connector is covered with "clean" Aclar or Nylon film and then capped with non-shedding end caps - which will not come into contact with the inner surface.
The bag is sealed to provide a waterproof environment.
- 4) Valves with sharp edges will have additional padding to prevent puncture of bags during shipping.
- 4) Each finished valve is bagged and sealed in a 6 mil thick clean polyethylene with 99.999% nitrogen, 0.01-micron filtered purge, to prevent contamination.
- 5) Valves are only removed from the cleanroom environment in sealed, non-shedding containers or with appropriately capped ends.

Shipping

All shipments of 50 pounds or greater are packaged in heavy duty crates with voids filled with shock-absorbing materials. The crates are wrapped in stretch plastic.



Marking

- 1) All valves are marked as follows:
 - Part series description
 - Manufacturers name
 - Body material
 - Seat material
 - Size
 - Pressure rating
 - Special identification code for nonstandard components
 - Color coded sleeves
- 2) The heat numbers are marked indelibly on the tube stubs, valve, block and outside of the protective bag.

Quality Assurance Specifications

- 1) Habonim's quality system conforms to the requirements of ISO 9001 and is approved by the Israel Standard Institution (member of EQNET). Habonim conforms the Pressure Equipment Directive 97/23/EC requirements. All valves can be certified to ISO 10474 (DIN EN10204)-3.1.B, if required.
- 2) Test reports are supplied for each size and heat number. Documentation of reports include the following:
 - a. Alloy.
 - b. Measured pipe wall thickness tolerance.
 - c. Lot number.
 - d. Year and month of manufacture.
 - e. Certificate of conformance to all requirements of this specification and an additional data which includes:
 1. 100% leak rate guarantees (inboard and across the seat) for instantaneous helium leak, discounting the effects of diffusion of helium through seat and seal materials.
 2. Particle generation tests (if requested).
 3. Moisture tests (if requested).
 4. Flow coefficient (Cv) data.
 5. Detailed description of cleaning procedures.
- 3) "HABONIM" employs an independent laboratory to verify that source DI water used for final rinsing is of the purity indicated.
- 4) "HABONIM" employs an independent laboratory for particle testing. This test is done by request.
- 5) By request, "HABONIM" would provide tubes of welded extensions that are 6 inches long with each valve size and heat number, for use in making weld tests to develop weld programs.



Standard Reference

ASTM A450

STANDARD SPECIFICATION FOR GENERAL REQUIREMENTS FOR CARBON, FERRITIC ALLOY, AND AUSTENITIC ALLOY STEEL TUBES.

ASTM A632

STANDARD SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL TUBING (SMALL DIAMETER) FOR GENERAL SERVICE.

ASTM A269

STANDARD SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL TUBING FOR GENERAL SERVICE.

NEPA 99

HEALTH CARE FACILITIES.

ANSI/ASME B.31.3

CHEMICAL PLANT AND PETROLEUM REFINERY PIPING.

SEMATECH 9012043B - STD

SEMASPEC TEST METHOD FOR XPS ANALYSIS OF SURFACE COMPOSITION AND CHEMISTRY OF ELECTROPOLISHED STAINLESS STEEL TUBING FOR GAS DISTRIBUTION SYSTEM COMPONENTS.

FEDERAL STANDARD 209E

AIRBORNE PARTICULATE CLEANLINESS CLASSES IN CLEANROOMS AND CLEAN ZONES (particle counting only).

"VQC" - WELD ACCEPTANCE CRITERIA PROCEDURE No. 96-09-04.

"VQC" - PARTICLES TEST PROCEDURE No. 96-09-05.

"VQC" - LEAK TEST PROCEDURE No. 96-09-06.

MIL-STD-105E

SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES.

"HABONIM"

WORK PROCEDURES FOR ASSEMBLY AND PRESSURE TESTS.

ASTM A182/ A182M

STANDARD SPECIFICATION FOR FORGED OR ROLLED ALLOY-STEEL PIPE FLANGES, FORGED FITTINGS, AND VALVES AND PARTS FOR HIGH-TEMPERATURE SERVICE.

ASTM A351/ A351M

STANDARD SPECIFICATION FOR CASTING, AUSTENITIC- FERRITIC (DUPLEX), FOR PRESSURE-CONTAINING PARTS.

"HABONIM"

Q.A PROCEDURES ACCORDING TO ISO 9001.



TEST RESULTS

SUBJECT

Testing of "HABONIM" Clean-For-Oxygen service valves, with respect to semi conductor requirements.

INTRODUCTION

This report is based on 8 valve samples supplied by "HABONIM" to be tested in accordance with the semi conductor specifications for Low-Purity (Cleaned-For-Oxygen Service) Stainless Steel Tubing.

The test was done in two parts (Each part included 4 valve samples) :

PART I

Helium Leak test.

Moisture test.

Particles test.

PART II

Helium Leak test using a bell jar.

NOTE : All tests were carried out in accordance with Sematech relevant standards to high purity 316-L Electropolish Stainless Steel.

1. Results

(PART I)

A. Leak test :

The valve passed five series of tests. In each serial, the valve was opened/closed 100 times under N₂ purge (Total 500 cycles).

The valves were tested using a leak-detector machine with a sensitivity of 1×10^{-10} atm cc He/sec.

The test was carried out on four valves supplied by "HABONIM".

All four valves passed the test with no notable changes in the results.

The results are as follows:

Base vacuum was: **1×10^{-5} Torr**

Base Leak Rate was: **3×10^{-9} atm cc/sec**

Out Board Test: **3×10^{-9} atm cc/sec**

Across the seat test: **A. He pressure was: 30psi**

B. He compression time was: 20sec.

C. Final Leak Rate was: 3×10^{-9} atm cc/sec



TEST RESULTS

B. Moisture test:

The moisture test was carried out on one valve using a moisture analyzer machine with a sensitivity level of ten parts per billion and a 4.5/9 purity N₂. The results are as follows:

Test Time	1.5 hours.
Amount of moisture in N ₂ at the beginning of test	450 ppb
Amount of moisture in N ₂ at the end of test	89 ppb

C. Particle test:

The particle test was carried out on one valve using a particle counter machine with a sensitivity level of 0.1 micron. A Pittot tube and a 4.5/9 purity N₂. The results are as follows:

Test flow	1000 fpm
Test Time	40 minutes.
Sampling Time	1 minute.
Frequency	10 minutes.
Amount of particles at the end of test	< 0.1uin particles = 0
	< 0.3uin particles = 0
	< 0.5uin particles = 0

Helium leak test using a bell jar

The valves were installed, one at a time, in a bell jar. The bell jar was then pumped down to a 1x10⁻⁹ sec/He leak rate. A 10% He balance N₂ gas was then injected into the valve at 250 PSIG. The time was then measured until He started showing on the He leak detector. The reading was noted and the test terminated after the valve reached a leak rate of 1x10⁻⁶. Each valve was then cycled 500 times and retested.

Initial Leak Test (measured in minutes):

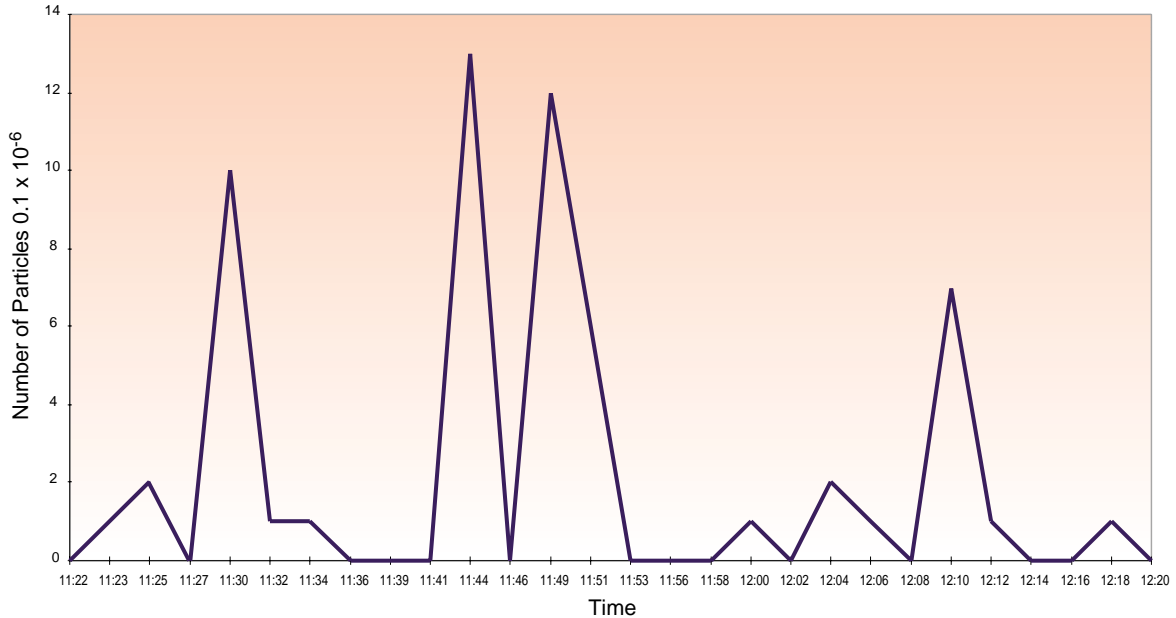
Valve #	Start Rise	From 1x10 ⁻⁹ to 1x10 ⁻⁸	From 1x10 ⁻⁸ to 1x10 ⁻⁶
1	3:25	4:45	5:00
2	3:10	4:05	4:25
3	3:45	4:50	5:05
4	3:40	4:35	4:55

After Cycling Valves 500 Times (measured in minutes):

Valve #	Start Rise	From 1x10 ⁻⁹ to 1x10 ⁻⁸	From 1x10 ⁻⁸ to 1x10 ⁻⁶
1	2:10	2:40	2:55
2	1:05	1:25	1:40
3	1:15	1:30	2:00
4	0:50	1:10	1:35



Habonim valve particle test graph



Test Procedure

The valve was connected to a test circuit in which there is gas supply and particle counter. The valve was opened and closed 10 times. N₂ gas with 99.998% purity was then passed through the system at 1000 fpm. The particles were counted in cycles, each cycle consisting of 1 minute counting and two minutes delay between counting. The cycle terminated when the particle counter achieved a reading of zero for particle size 0.1 micron. The cycles were repeated 10 times.

Habonim valve particle test table

	Time	Particles Count
cycle 1	11:22	0
	11:23	1
	11:25	2
cycle 2	11:27	0
	11:30	10
	11:32	1
	11:34	1
cycle 3	11:36	0
	11:39	0
	11:41	0
cycle 4	11:44	13
	11:46	0
	11:49	12
cycle 5	11:51	6
	11:53	0
	11:56	0
cycle 6	11:58	0
	12:00	1
	12:02	0
cycle 7	12:04	2
	12:06	1
	12:08	0
	12:10	7
cycle 8	12:12	1
	12:14	0
	12:16	0
cycle 9	12:18	1
	12:20	0
	12:22	0
	12:24	0



HABONIM VALVE FEATURES

Port	Size	Cv	Valve Ball Orifice	Pipe Orifice	Wall Thickness
Standard Port	1/2"	8	0.44	0.40	0.049
Standard Port	3/4"	20	0.56	0.62	0.065
Standard Port	1"	34	0.81	0.87	0.065
Standard Port	1 1/2"	82	1.25	1.37	0.065
Full Port	1 1/2"	130	1.37	1.37	0.065
Reduced Port	2"	135	1.50	1.87	0.065
Full Port	2"	480	2.01	1.87	0.065
Reduced Port	3"	460	2.51	2.87	0.065
Full Port	3"	1250	2.87	2.87	0.065
Reduced Port	4"	770	3.26	3.84	0.083
Full Port	4"	2500	4.00	3.84	0.083
Reduced Port	6"	1200	4.38	5.78	0.109
Full Port	6"	5400	5.90	5.78	0.109

Item	Description
Valve compression fitting and purge	One-piece compression fitting end connector. Stainless St. or Brass Compression fitting nut with front and back ferrule.
Valve end stubs	One-piece OD stub end connector. OD tubing faced and squared suitable for Automatic Orbital Welding (AOW).
Valve Locking Device	Spring loaded locking device fitted to the valve handle for secure "Locked-in-Last-Position" (LLP). Up to 2 1/2" only.
Duplex Construction	Manifold block with OD tube stubs welded to main port and two branched valves connected to sides.
Duplex Advantage	Minimum space, easy maintenance. Strong, compact and vibration resistant. Saves additional welding and handling in field. Suitable for installation without additional cleaning in field.
Duplex Patterns	Horizontal Cross, Horizontal Tee, Vertical Tee, Horizontal Vee.
Main Tubes	Matched to construction heat lots on request, in 316L or 304L, Copper type "K" or "L".
Purge ports	VCR or Compression Fitting Valve size 1 1/4" and less: 1/4" Valve size 1 1/2" and greater: 1/2"
Surface finish of all wetted parts	Standard: grit 180 (Ra 25 average) Special: grit 240 and above (Ra 15-20 or lower)
Cleaning	Dipped and rinsed in DI water, dried, assembled and Helium leak tested in cleanroom.
Packaging	End connectors are covered with Aclar nylon film and capped. Valves are packaged and sealed in polyethylene bags (one or double) filled with filtered nitrogen purge.
Lubricants	No lubricants
Certification	ISO 10474 (DIN EN 10204) 3.1B PED 97/23/EC (CE)



The HABONIM High Purity Ball Valve Identification Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0	5			I	6	7	-	6	6	6	6	R	T	/	L	L	E	T	O	G	-	X	2	1	S	M	Y	K	O
1	2	3	-	4	5	/	6	7	-	8	9	10	11	12	13	14													

VALVE SIZE 1

02	1/4"
03	3/8"
05	1/2"
07	3/4"
10	1"
12	1 1/4"
15	1 1/2"
20	2"
25	2 1/2"
30	3"
40	4"
60	6"

SERVICE 2

B	FULL BORE
I	DI-CFOS

SERIES 3

46	STANDARD
66	FDS
67	FDS
J6	JUNCTION VALVE

MATERIAL 4

BODY/END/BALL/STEM	
1	BRONZE
5	BRASS
6	SS 316/316

SEAT/BODY SEAL 5

T	PTFE VIRGIN
R	PTFE 15% GF

CONNECTION 6

BWO	BW O.D.
BWI	BW O.D. ISO
BWJ	BW O.D. JIS
ETO	EXT. BW O.D.
ETI	EXT. BW O.D. ISO
ETJ	EXT. BW O.D. JIS
ETB	COPPER EXT. Tb L
ETX	COPPER EXT. Tb X
KLM	SW Type K,L,M
XYZ	SW Type X,Y,Z
LL	COMPRESSION (IN)
LM	COMPRESSION (MM)
LB	BRASS CAP
J2	2 JUNCTION VALVES
J3	3 JUNCTION VALVES
DV	DUAL VERTICAL VALVE
DH	DUAL HORIZONTAL VALVE
PV	DUAL VERTICAL VALVE (PCW)
PH	DUAL HORIZONTAL VALVE (PCW)
150	FLANGED ANSI #150 RF
150F	FLANGED ANSI #150 FF
SW	SOCKET WELD SCH 40
BW	BUTT WELD SCH 40

FEATURE 7

E	ELECTRO POLISH
G	GRIT 240 (15Ra)

PATTERN 8

X1	SINGLE HORIZONTAL CROSS
X2	DUAL HORIZONTAL CROSS
T1	SINGLE HORIZONTAL TEE
T2	DUAL HORIZONTAL TEE
T3	SINGLE VERTICAL TEE
T4	DUAL VERTICAL TEE
V2	DUAL HORIZONTAL VEE CROSS
P1	SINGLE HORIZONTAL CROSS (PCW)
P2	DUAL HORIZONTAL CROSS (PCW)
H4	4 POINT OF CONNECTION (POC)
H8	8 POINT OF CONNECTION (POC)

LINE/BRANCH SIZE 9

1	1 1/2" X 1/2"
2	2" X 3/4"
3	1/4" X 1/4"
4	3/4" X 1/4"
6	2" X 1/2"
7	1" X 1/2"
8	1" X 3/4"
9	3/4" X 1/2"
A	1/2" X 1/2"
B	2" X 1"
C	3/4" X 3/4"
D	1 1/2" X 3/4"
E	2" X 1 1/2"
F	1" X 1/4"
G	2" X 2"
H	1" X 1"
I	1/2" X 1/4"
J	4" X 1"
K	1/2" X 3/8"
L	2 1/2" X 1/2"
M	4" X 2"
N	1 1/2" X 1"
O	1 1/2" X 1 1/2"
P	3" X 2"
Q	3" X 3"
R	4" X 3"
S	1" X 3/4"
T	4" X 4"
U	6" X 3"
V	6" X 2"
W	3" X 1"
X	6" X 1 1/2"
Y	3" X 1 1/2"
Z	4" X 1 1/2"

BLOCK / LINE MATERIAL 10

S	316L / 316L
B	BRASS / COPPER
F	316L / COPPER
J	304L / 304L

PURGE PORTS 11

L	S/S COMPRESSION
B	BRASS COMPRESSION
C	VCR FEMALE
M	VCR MALE
V	VALVE
O	O.D. TUBE

HANDLE COLOR 12

(BLUE IS STANDARD)

Y	YELLOW
R	RED
W	WHITE
H	BLACK
G	GREEN
P	PINK

LOCKING DEVICE 13

K	LOCKING DEVICE (LLP)
D	LOCKING DEVICE

OTHER FEATURES 14

A	ACTUATED
O	OVAL HANDLE
S	SCORPION HANDLE
I	ISO 1127 MAIN LINE
NF	NUTS & FERRULES FOR COMPRESSION ENDS



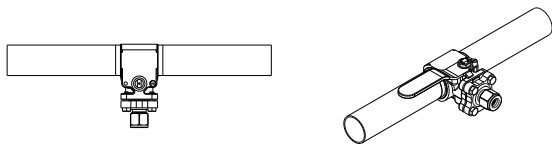
The HABONIM High Purity Ball Valve

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0	5			I	6	7	-	6	6	6	6	R	T	/	L	L	E	T	O	G	-	X	2	1	S	M	Y	K	O	
1	2	3	-		4	5	/		6	7	-	8	9	10	11	12	13	14												

PATTERN



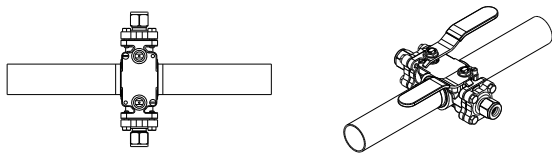
X1 SINGLE HORIZONTAL CROSS



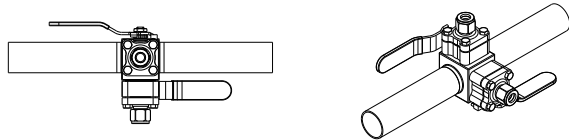
T4 DUAL VERTICAL TEE



X2 DUAL HORIZONTAL CROSS



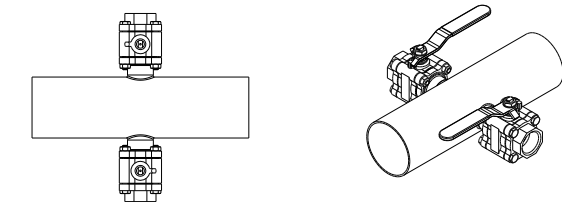
V2 DUAL HORIZONTAL VEE CROSS



T2 DUAL HORIZONTAL TEE



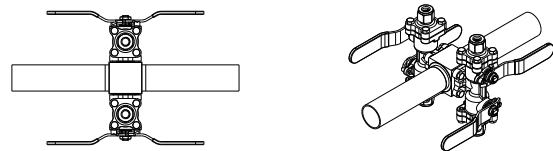
P2 DUAL HORIZONTAL CROSS (PCW)



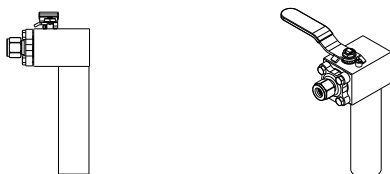
T1 SINGLE HORIZONTAL TEE



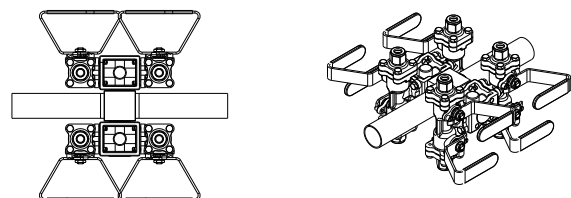
H4 4 POINT OF CONNECTION (POC)



T3 SINGLE VERTICAL TEE



H8 8 POINT OF CONNECTION (POC)





The HABONIM High Purity Ball Valve

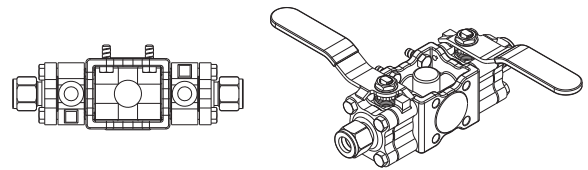
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0	5	I	6	7	-	6	6	6	6	R	T	/	L	L	E	T	O	G	-	X	2	1	S	M	Y	K	O		
1	2	3	-	4	5	/	6	7	-	8	9	10	11	12	13	14													

END CONNECTION

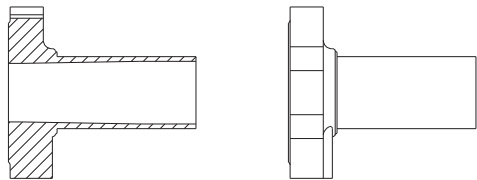
BWO, BWI, BWJ BUTTWELD O.D.



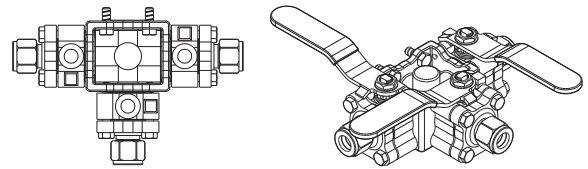
J2 2 JUNCTION VALVES



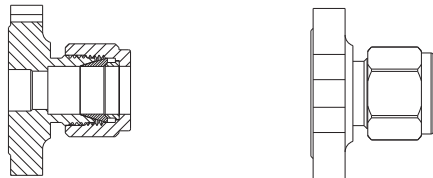
ETO, ETI, ETJ EXTENDED BW O.D.



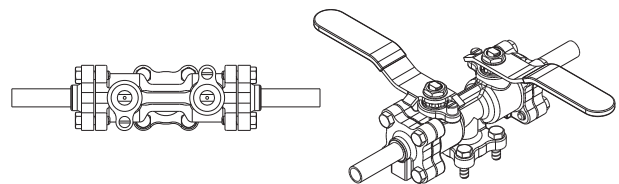
J3 3 JUNCTION VALVES



LL COMPRESSION (IN)
LM COMPRESSION (MM)



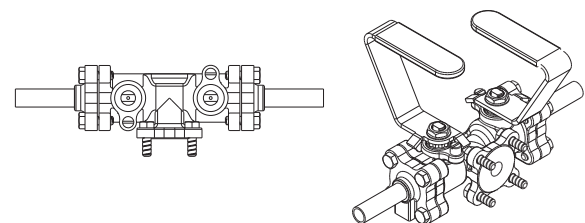
DV DUAL VERTICAL VALVE BODY



KLM SW Type K ,L,M
XYZ SW Type X,Y,Z



DH DUAL HORIZONTAL VALVE BODY



ETB COPPER EXT. Type L
ETX COPPER EXT. Type X

